D E C L A R A T I O N

I, Ryuichi YAMADA, a Japanese Patent Attorney registered No. 7898 having my Business Office at Hasegawa Bldg., 4F, 7-7 Toranomon 3-chome, Minato-ku, Tokyo, Japan, solemnly and sincerely declare:

That I have a thorough knowledge of Japanese and English languages; and

That the attached pages contain a correct translation into English of the specification of the following Japanese Application:

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Applicant(s)

CANON KABUSHIKI KAISHA

Signed this 6th day of August, 2004.

Ryuichi YAMADA

PATENT OFFICE

JAPANESE GOVERNMENT

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Applicant(s)

CANON KABUSHIKI KAISHA

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Specification

[Title of the Invention]

Liquid Container

[Claims]

1. A liquid container, comprising:

a casing for accommodating a liquid retaining means for absorbing and retaining a liquid;

an opening for liquid supply provided in said casing, for supplying the liquid contained in said casing out;

an opening for air vent provided in said casing, for introducing an ambience into said casing;

wherein said liquid container is detachably mountable to an outer member, and wherein said liquid is supplied to the outer member while said liquid retaining means is abutted to said outer member;

wherein said liquid retaining means comprises a first liquid retaining member for abutting to the outer member, and a second liquid retaining member closely contacted to said first liquid retaining member to supply the liquid to said first liquid retaining member, wherein said first liquid retaining member has a liquid retaining force which is larger than that of said second liquid retaining member; and

wherein said first liquid retaining member is retained such that it follows substantially an inner surface configuration of the portion where said opening for said liquid supply of said casing is provided.

2. A liquid container according to Claim 1, wherein said first liquid retaining member is in the form of sheet.

3. A liquid container according to Claim 1 or 2, wherein said first liquid retaining member is accommodated in said casing, by which said first liquid retaining member is retained while said first liquid retaining member is forcedly deformed such that it follows substantially the inner surface configuration of a portion where said opening for liquid supply of said casing is provided.

4. A liquid container according to Claim 1 or 2, wherein said first liquid retaining member is formed beforehand such that it follows substantially the inner surface configuration of the portion where said opening for liquid supply of said casing is provided.

5. A liquid container according to any one of Claims 1 to 4, wherein at least one of said first

liquid retaining member and said second liquid retaining member is made of fibrous material.

6. A liquid container according to Claim 5, wherein said first liquid retaining member is made of said fibrous material, and an axial direction of most of the fibers constituting said fibrous material is substantially perpendicular to an abutting direction of said outer member.

7. A liquid container according to Claim 6, wherein said first liquid retaining member is made of fiber aggregate of said fibrous material, and wherein the direction of lamination of said fiber aggregate is substantially parallel to the abutting direction of said outer member.

8. A liquid container according to Claim 7, wherein an axial direction of most of the fibers constituting said laminated fibrous material is substantially perpendicular to the abutting direction of said outer member, and is substantially parallel to the longitudinal direction of a surface where said opening for liquid supply of said casing is provided.

9. A liquid container according to any one of Claims 5 to 8, wherein most of the fibers constituting

said fibrous material is made of thermoplastic resin material.

10. A liquid container according to Claim 9, wherein said thermoplastic resin material constitutes of a polyolefin resin material.

11. A liquid container according to Claim 10, wherein most of material constituting said casing constitutes of a polyolefin resin material.

[Detailed Description of the Invention]

[Field]

The present invention relates to a liquid container as an ink container to be mounted relative to an ink jet recording apparatus, which is abutted to an outer member to supply a liquid to the outer member.

[Related Background Art]

In an ink jet recording apparatus for effecting recording by ejecting the ink droplet, the structure that an ink jet head and an ink container are formed as a separated member, respectively, and the ink jet head and the ink container are integrally formed in use, has been known. The ink container employed in such an ink jet recording apparatus is required to have a function of generating an

appropriate degree of back pressure (negative pressure) of the ink, in order to stably retain the ink in a normal stage (non-recording state) and to stably supply the ink into the ink jet head during the recording operation.

As one of ordinary methods to generate the negative pressure, there is provided a method wherein a porous material such as urethane foam is used as a negative pressure generating member (ink absorbing material), and the capillary force generated by the porous material is used, as disclosed in Japanese Laid-Open Patent Application No. HEI-8-230207. As an example of the conventional ink container using the capillary force, the description will be made as to the structure wherein an ink container and an ink jet head are formed as a separated member, respectively, and the ink container and the ink jet head are integrally formed in use, with reference to Figure 8.

Figure 8, (a) is a schematic sectional view illustrating a state in which an ink jet head 132 is separated from an ink container 110; Figure 8, (b) is a schematic sectional view illustrating a state in which an ink jet head 132 is integral with an ink container 110. The ink container shown in Figure 8, (a) comprises a casing 111 constituting an ink accommodating portion for accommodating the ink, an ink absorbing material 161 retained in the ink

accommodating portion, for absorbing and retaining the ink by the capillary force. The casing 111 comprises a main body 111a and a cap member 111b. An ink supply port 114 for supplying the ink into the ink jet head 132 is formed in the main body 111a of the casing 111. An air vent 115 for introducing an ambience into the ink accommodating portion in order to supply smoothly the ink, and a rib structure 113 for providing a buffer space are formed in the cap member 111b of the casing 111. An ink discharging member 162 which is an ink absorbing material which is the material different from the ink absorbing material 161 is retained such that the ink discharging member 162 is compressed to the ink absorbing member 161. In this example, the ink absorbing material 161 and the ink discharging member 162 are made of fibrous material, respectively. The capillary force (ink retaining force) of the ink discharging member 162 is larger than that of the ink absorbing material 161. As a result, the ink can be stably retained in the ink discharging member 162 around the ink supply port 114, so that the stabilized ink supply of the ink container to the ink jet head 132 can be accomplished.

The ink receiving tube 133 connected to the ink jet head 132 is abutted to the ink discharging member 162 to supply the ink from the ink container 110 into the ink jet head 132. A filter (unshown) for

preventing invasion of foreign matter or bubble into the ink jet head 132 through the ink receiving tube 133, is mounted at a free end of the ink receiving tube 133.

Referring to Figure 8, (b), the ink receiving tube 133 is inserted into the ink supply port 114 until the ink discharging member 162 is pushed into the ink container 110. By doing so, the ink receiving tube 133 and the ink discharging member 132 are compressed firmly to each other.

[Patent Reference]

Japanese Laid-Open Patent Application No. Hei-7-230207

[Problems to be Solved]

A small size recording apparatus having a high portable property has been further developed in accordance with the spread of the ink jet recording apparatus. In such a small size recording apparatus, the ink container is also downsized when the main assembly of the recording apparatus is downsized. In the above-mentioned conventional structure, a minute space 163 not having a member for retaining the ink, exists around the ink discharging member 162 provided in the ink supply port 114, as shown in Figure 8, (a) and 8, (b). When the ink container 110 is downsized, the inside volume ratio of a space which can not retain the ink raises among the whole inside volume of

the ink container 110 since the inside volume occupied the minute space 163 is increased.

The ink supply speed from the ink container 110 to the ink jet head 132 has to be raised when the recording speed in the ink jet recording apparatus is further increased.

The description will be made as to the movement of the ink in the ink absorbing material 161 in use of the ink jet recording apparatus, that is, during the ink supply. In the above-mentioned ink absorbing material 161, the fibers are arranged with a desired distribution macroscopically, but the distribution state of the fibers are not uniform microscopically due to the variation in the gaps between the fibers and/or in the thickness of the fibers and/or due to the error in the manufacturing step, and the spaces are not uniform at all of the position. The flow resistance against the movement of the ink retained is different between the sparse fiber portion and dense fiber portion constituting the ink absorbing material 161, and a large amount of the ink is discharged for the sparse fiber portion where the flow resistance is low. The influence of the difference increases with the increase of the ink flow speed. When the ink supply speed is increased in an attempt to accomplish the high speed recording, the ink retained in the sparse fiber portion of the ink

absorbing material 161 is consumed with high priority even to such an extent that before start of discharge of the ink retained in the dense fiber portion, so that the ink surface in the dense fiber portion of the fiber absorbing material is lowered around the ink discharging member 162, and then, the ink flow path is disconnected, with result of stop of ink supply and therefore disabled printing operation before the inks in the ink absorbing material 161 are completely used up. In this state, the ink which is discarded vainly sufficiently remains.

Particularly, the distance (ink flow path) from the ink retained at a position away from the ink supply port 114 and the ink supply port 114 is longer in the ink absorbing material 161, so that the flow resistance against the movement of the ink retained is increased. Further, the ink retained at a position right above the ink supply port 114 can be more easily discharged since the gravity direction is substantially same as the ink flow direction. On the contrary, the ink retained adjacent the bottom surface of the ink container 110 away from the ink supply port 114 in the horizontal direction is not easily discharged, and is easily remained, since the ink flow is not easily influenced by the gravity.

In order to increase the retainable amount of the ink in the ink container 110 having the ink

absorbing material 161 when the ink container 110 is downsized superficially as the recording apparatus is downsized, an attempt can be made to increase the height of the ink container 110, the capillary force for retaining the ink against the gravity has to be increased. In view of this, the space in the ink absorbing member 161 has to be reduced, this results in the fiber density in the ink absorbing material 161. The fiber density per unit volume is increased, which means a reduced ink retaining space, and therefore, the retainable amount of the ink decreases.

In the ink container 110, it is possible to attempt to form the structure with which the height of the ink container 110 is suppressed, and the ink can be retained in the ink container 110 even when the capillary force is relatively small. In this case, the distance from the ink retained at a position right above the ink supply port 114 in the ink absorbing material 161 and the ink supply port 114 is short, so that the ink can be more easily discharged. However, the ink which exists adjacent the bottom surface of the ink container 110 away from the ink supply port 114 in the horizontal direction, and which is not easily influenced by the gravity, is not easily discharged irrespective of the height of the ink container 110. As a result, the ink use efficiency tends to decrease because of the large difference in

the easiness of the ink supply due to the difference in the distance from the ink supply port.

Further, the case in which the ink absorbing member 161 and the ink discharging member 162 are made of the fiber aggregate, respectively, is described. However, the same problems occur in the case in which the ink absorbing member 161 and the ink discharging member 162 are made of porous material, respectively. Furthermore, the above-mentioned same problems occur in the case that the liquid other than ink is used.

Accordingly, it is a principal object of the present invention to provide a liquid container provided with an absorbing member for absorbing and retaining the ink is accommodated, wherein the liquid container can be downsized, and a large amount of the liquid is retained, and a stabilized liquid supply operation can be accomplished even when a large flow rate of the liquid is supplied.

[Means for Solving]

In accordance with a principal aspect of the present invention, there is provided a liquid container, comprising: a casing for accommodating a liquid retaining means for absorbing and retaining a liquid; an opening for liquid supply provided in the casing, for supplying the liquid contained in the casing out; an opening for air vent provided in the casing, for introducing an ambience into the casing;

wherein the liquid container is detachably mountable to an outer member, and wherein the liquid is supplied to the outer member while the liquid retaining means is abutted to the outer member; wherein the liquid retaining means comprises a first liquid retaining member for abutting to the outer member, and a second liquid retaining member closely contacted to the first liquid retaining member to supply the liquid to the first liquid retaining member, wherein the first liquid retaining member has a liquid retaining force which is larger than that of the second liquid retaining member; and wherein the first liquid retaining member is retained such that it follows substantially an inner surface configuration of the portion where the opening for the liquid supply of the casing is provided.

In a liquid container according to the present invention, it is preferred that first liquid retaining member is in the form of sheet.

In a liquid container according to the present invention, it is preferred that the first liquid retaining member is accommodated in the casing, by which the first liquid retaining member is retained while the first liquid retaining member is forcedly deformed such that it follows substantially the inner surface configuration of a portion where the opening for liquid supply of the casing is provided. Further,

it is preferred that the first liquid retaining member is formed beforehand such that it follows substantially the inner surface configuration of the portion where the opening for liquid supply of the casing is provided.

In a liquid container according to the present invention, it is preferred that at least one of the first liquid retaining member and the second liquid retaining member is made of fibrous material. Particularly, it is preferred that the first liquid retaining member is made of the fibrous material, and an axial direction of most of the fibers constituting the fibrous material is substantially perpendicular to an abutting direction of the outer member. Further, it is preferred that the first liquid retaining member is made of fiber aggregate of the fibrous material, and wherein the direction of lamination of the fiber aggregate is substantially parallel to the abutting direction of the outer member. In addition, it is also preferred that an axial direction of most of the fibers constituting the laminated fibrous material is substantially perpendicular to the abutting direction of the outer member, and is substantially parallel to the longitudinal direction of a surface where the opening for liquid supply of the casing is provided.

In a liquid container according to the present invention, most of the fibers constituting the

fibrous material may be made of thermoplastic resin material. Further, the thermoplastic resin material may constitute of a polyolefin resin material. In this case, it is preferred that most of material constituting the casing constitutes of a polyolefin resin material.

In the liquid container of the present invention, the liquid retaining force of the first liquid retaining member is larger than that of the second liquid retaining member, so that the liquid in the liquid container is easily retained adjacent the outer member which is a liquid discharging point (supply point). Therefore, the liquid in the liquid container is effectively retained. Further, the first liquid retaining member follows substantially the inner surface configuration of the portion (bottom surface) where the opening for liquid supply of the casing is provided, so that the liquid in first liquid retaining member is not easily influenced by the variation of the liquid flow moved in the second liquid retaining member during the liquid supply, that is, the variation of the flow resistance (variation of fiber density) in the second liquid retaining member. As a result, the stabilized liquid supply can be accomplished even when the large flow rate of the liquid is supplied.

More particularly, in the thin and flat

liquid container, the liquid retained adjacent the bottom surface of the liquid container away from the opening for liquid supply in the horizontal direction, is not easily discharged. The possibility that the liquids retained in the other positions are more easily consumed than the liquid retained adjacent the bottom surface of the liquid container away from the opening for liquid supply in the horizontal direction, is high. However, with the structure of the present invention, the stabilized ink supply can be accomplished irrespective of the above-mentioned configuration.

In addition, the first liquid retaining member is substantially the same as the inner surface configuration of the casing, so that the inner space of the casing is effectively employed without complicating the configuration of the casing, particularly, the inner surface configuration of the casing.

The liquid retaining force of the first liquid retaining member is larger than that of the second liquid retaining member, so that the amount of the liquid remaining in the first liquid retaining member is relatively larger than the amount of the liquid remaining in the second liquid retaining member after the liquid discharge. Particularly, this situation is easily more influenced in the case in

which a high speed ink supply is carried out. In this case, the first liquid retaining member is in the form of a thin sheet, so that the inside volume of the first liquid retaining member is reduced, and the amount of the liquid remaining in the first liquid retaining member is also reduced, in addition to the above effects.

[Detailed Description of the Preferred Embodiments]

Hereinafter, the preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. The drawings are schematic for easy understanding of the embodiments of the present invention, and the scale is not always uniform.

(First Embodiment)

The first embodiment of the present invention will be described with reference to the drawings. Figures 1 and 2 illustrate an ink jet cartridge 30 which comprises an ink container 10 (liquid container) and a holder 31 to which the ink container 10 is mountable. Figure 1 is a perspective view of an outer appearance of an ink container and a holder which constitute an ink jet cartridge according to an embodiment of the present invention; Figure 2 is a partly broken perspective view thereof. Figures 1 and 2 illustrate a state in which the holder 31 and the ink container 10 are separated to each other for

better understanding, respectively.

As shown in Figure 1, the ink jet cartridge 30 includes a holder 31 having an integral ink jet head 32 for ejecting the ink, and an ink container 10 detachably mountable to the holder 31. The ink container 10 accommodates the ink which is liquid to be supplied to the ink jet head 32.

The ink jet head 32, in use, is disposed on the bottom portion of the holder 31 and is provided with a group (unshown) of ejection outlets through which the ink supplied from the ink container 10 is ejected out. At the connecting portion between the holder 31 and the ink container 10, an ink receiving tube (outer member) 33 is projected, and the ink receiving tube 33 is in fluid communication with the group of the ejection outlets through the ink supply passages (unshown). The free end of the ink receiving tube 33 is provided with a filter 34 for preventing invasion of foreign matter into the ink receiving tube 33. When the ink container 10 is mounted to the holder 31, the ink is supplied to the group of the ejection outlets by way of the ink receiving tube 33 and the ink supply passage from the ink container 10.

The ink container 10 comprises a casing 11 constituting the ink accommodating portion, and the casing 11 comprises a main body 11a which is open at the top, and a cap member 11b for closing the opening

of the main body 11a. The cap member 11b has an air vent 15 and a rib structure 13 for forming a buffer space. As shown in Figure 3, the bottom portion of the main body 11a of the casing 11 is provided with an ink supply port 14 at a position facing to the ink receiving tube 33 of the holder 31 when the ink container 10 is mounted to the holder 31. Around the ink receiving tube 33, there is provided an o-ring (unshown) to prevent leakage, into the holder 31, of the ink supplied through the ink receiving tube 33 from the ink container 10 and to prevent evaporation of the ink.

Within the casing 11, there are provided a first ink retaining member 50 and a second ink retaining member 51 for being impregnated with the respective inks to retain them. The first ink retaining member 50 is disposed between the second ink retaining member 51 and the bottom surface of the ink container 10 and is closely contacted to the second ink retaining member 51 so as to plug the ink supply port 14 at the inside. The first ink retaining member 50 follow substantially the inner surface configuration of the portion (bottom surface) where the ink supply port 14 of the casing 11 is provided.

The first ink retaining member 50 and the second ink retaining member 51 both function to absorb and retain the ink, but the ink retaining force

(capillary force) of the first ink retaining member 50 is larger than that of the second ink retaining member 51. Accordingly, the ink retained in the second ink retaining member 51 is efficiently supplied to the first ink retaining member 50 with the result that usability of the ink retained in the second ink retaining member 51 is improved. In this embodiment, the ink retaining members 50, 51 comprise a laminated webs in which fibers of polyolefin thermoplastic resin material are oriented substantially unidirectionally, and the fibers are compressed in the direction of lamination (fiber aggregate). The first ink retaining member 50 is made of fibers with a fineness of 6.7 dtex (diameter: approx. 54 μm), and the density after compression is approx. 0.08 g/cm^3. The second ink retaining member 50 is made of fibers with a fineness of 2.2 dtex (diameter: approx. 18 μm), and the density after compression is approx. 0.20 g/cm^3.

The longitudinal directions of most of the fibers constituting the fibrous material of the first ink retaining member 50 and the second ink retaining member 51 (axial direction) are substantially perpendicular to the abutting direction A (Figure 3) of the ink receiving tube 33, and the laminating direction of the web of the fibrous material is disposed in the casing 11 such as to be substantially parallel with the abutting direction A of the ink

receiving tube 33.

The first ink retaining member 50 and the second ink retaining member 51 are rectangular in configuration of 14 mm x 38 mm in a cross-section along an abutting direction A of the ink receiving tube 33, and a thickness of the first ink retaining member 50 measured in a direction A of abutment to the ink receiving tube 33 is 1.5 mm, and that of the second ink retaining member is 12.5 mm. Therefore, the first ink retaining member 50 is in the form of a thin sheet.

The casing 11 of the ink container 10 in this embodiment, that is, the main body 11a which is open at the top, and the cap member 11b are made of polyolefin resin material, similar to the material of the first ink retaining member 50 and the second ink retaining member 51. Therefore, the recycling property and the reuse property are significantly improved, which is preferable from the standpoint of environmental health.

Referring to Figures 3, 4, the description will be made as to the state in which the ink jet head 32 and holder 31 are connected with the ink container 10. Figures 3, 4 are sectional side elevations of the ink container. In Figure 3 - 7, the holder 31 is omitted for better understanding.

In Figure 3, the ink container 10 is not

connected with the ink jet head 32 (holder 31). In Figure 4, the ink container 10 has been connected with the ink jet head 32 (ink container 10 has been mounted to the holder 31). In this state, the ink receiving tube 33 is contacted to the first ink retaining member 50 in the ink supply port 14, and the ink retained in the first ink retaining member 50 is supplied to a group of the ejection outlet of the ink jet head 32 by way of the ink receiving tube 33 and the ink supply passage.

In the state shown in Figure 4, the ink receiving tube 33 enters the ink supply port 14 so that ink receiving tube 33 is pressed into the first ink retaining member 50 (approx. 0.5 mm in this embodiment). The first ink retaining member 50 receives a force toward the second ink retaining member 51. Then, the first ink retaining member 50 and the second ink retaining member 51 are compressed in the abutting direction A in Figure 3.

The state of contact is shown in Figure 4, (b) in an enlarged scale. Thus, the insertion of the ink receiving tube 33 into the ink supply port 14 is accommodated by deformation of the ink retaining members 50, 51. First, the first ink retaining member 50 in the form of a sheet gradually deforms in accordance with insertion of the ink receiving tube 33, and the second ink retaining member 51 deforms

correspondingly to the first ink retaining member 50. As will be understood from Figure 4, (b), the second ink retaining member 51 is deformed by the first ink retaining member 50 such that deformation is maximum adjacent the central portion where the ink receiving tube 33 is abutted to the first ink retaining member 50 and that compression ratio gradually decreases away from the central portion therearound. Particularly in this embodiment, the directions of lamination of the fibers of the first ink retaining member 50 and the second ink retaining member 51 are substantially parallel with the contact direction A of the ink receiving tube 33, the fibers easily deform in the contact direction A. Therefore, the compression ratio around the ink supply port 14 can be increased without difficulty, and first ink retaining member 50 is compressed as compared with the normal state (Figure 3 state) in which it is not abutted by the ink receiving tube 33, so that ink retaining force is further enhanced, thus accomplishing more stable ink retention. By smoothing the deformation of the ink retaining members 50, 51 as a result of abutment of the ink receiving tube 133, the space in the ink container 10 not having the ink retaining members 50, 51 can be minimized.

The description will be made as to the movement of the ink in the ink container 10 during the

ink supply.

Figure 5 is a sectional view of the ink container 10 wherein it is abutted to the ink jet head 32 and is intended to schematically illustrate the movement of the inner ink in the ink container 10. In Figure 5, (a) - (e) schematically shows discharge of the ink as indicated by cross-hatching.

In Figure 5, (a), no ink has been consumed (initial state). The ink retaining members 50, 51 contains a full container capacity of ink. When the ink is supplied from the ink supply port 14 into the ink jet head 32 as shown in Figure 5, (b), the ink in the first ink retaining member 50 is consumed, and then the ink 52 in the second ink retaining member 51 is consumed, with the result that ink liquid surface 52 lowers, as shown in this Figure. In the state of Figure 5, (c), the ink is further consumed by the recording operation or the like of the ink jet head 32. In the portion right above the ink supply port 14, from which the ink is most easily discharged, the ink liquid surface 52 has lowered to a neighborhood of the first ink retaining member 50, but in the other portions, the ink sufficiently remains, and therefore, the ink liquid surface 52 is in the second retaining member 51. When the ink is further consumed, the ink in the second ink retaining member 51 gradually moves into the first ink retaining member 50, until almost

all of the ink in the second ink retaining member 51 is consumed while the first ink retaining member is substantially fully filled with the ink. The ink moves from the second ink retaining member 51 into the space in the first ink retaining member 50 resulting from consumption of the ink, and therefore, the first ink retaining member 51 can be maintained substantially filled with the ink. Then the state shown in Figure 5, Figure 5, (e) is reached wherein substantially no ink is retained in the second ink retaining member 51, but the ink is retained only in the first ink retaining member 50. When the ink is further supplied into the ink jet head 32, the ink is consumed from the first ink retaining member 50 until the ink container 110 is used up.

The description will further be made as to the mechanism of the ink consumption. The ink absorbed and retained in the second ink retaining member 51 is supplied into the ink receiving tube 33 through the first ink retaining member 50. As described hereinbefore, since the first ink retaining member 150 has an ink retaining force (capillary force) which is longer than that of the second ink retaining member 51, it is effective to gather the ink in the neighborhood of the ink receiving tube 33. Since the neighborhood of the portion of the first ink retaining member 50 where it is press-contacted by the

ink receiving tube 33 is compressed, the ink retaining force is further large.

The difference in the ink retaining force in the ink retaining members 50, 51 is far larger than the difference in the ink retaining force resulting from variations in the internal structure of the ink retaining member, so that variation in the inside structure can be ignored. Therefore, into the portion of the first ink retaining member 50 from which the ink is consumed, the ink is quickly supplied from the second ink retaining member 51 having the small ink retaining force. Thus, the ink liquid surface 52 is prevented from lowering at the interface between the ink retaining members 50, 51. After almost all parts of the ink in the second ink retaining member 51 including the parts far away from the ink supply port 14, the ink is further consumed. Then, there exist no ink which flows from the second ink retaining member 51 into the first ink retaining member 50. It is not until this point that portion free of the ink appears in the first ink retaining member 50. The fiber densities of the ink retaining members 50, 51 are so selected that difference in the capillary force between the ink retaining members 50, 51 is large enough to neglect the flow resistance difference resulting from the difference in the length of the ink flow path and/or the variation of the inside

structure. By doing so, the use efficiency of the ink of the ink container 10 can be improved.

(Second Embodiment)

Referring to Figures 6, 7, the description will be made as to a second embodiment. The same reference numerals as with Embodiment 1 is assigned to the elements having the corresponding functions for simplicity.

As shown in Figure 6, in this embodiment, a portion of the casing 11 of the ink container 10 to which the ink receiving tube 33 is abutted is formed as a raised or projected portion 11c, and a first ink retaining member 50 is disposed inside the projected portion 11c.

Also in this embodiment, the ink retaining members 50, 51 comprises a laminated webs in which fibers of polyolefin thermoplastic resin material are oriented substantially unidirectionally, and the fibers are compressed in the direction of lamination (fiber aggregate). The first ink retaining member 50 is made of fibers with a fineness of 6.7 dtex (diameter: approx. 54 μm), and the density after compression is approx. 0.05 g/cm^3. The second ink retaining member 51 is made of fibers with a fineness of 2.2 dtex (diameter: approx. 18 μm), and the density after compression is approx. 0.15 g/cm^3. The longitudinal directions of most of the fibers

constituting the fibrous material of the first ink retaining member 50 and the second ink retaining member 51 (axial directions) are substantially perpendicular to the abutting direction of the ink receiving tube 33, and the laminating direction of the web of the fibrous material is substantially parallel with the abutting direction A of the ink receiving tube 33.

The surface configuration of the first ink retaining member 50 in the cross-section taken along the abutting direction of the ink receiving tube 33 is rectangular (10 mm x 23 mm), and the thickness thereof is 1.5 mm. The surface configuration of the second ink retaining member is rectangular (14 mm x 23 mm), and the thickness thereof is 12.5mm.

The casing 11 of the ink container 10 (the main body 111a and the cap member) are made of polyolefin resin material similar to the material of the first ink retaining member 50 and second ink retaining member 51.

In this embodiment, the ink container 10 has such a relatively complicated structure as having a projected portion 11c at the ink supply port 14 side due to the structure of the main assembly of the recording device. Under such a condition, as shown in Figure 6, the thickness of the first ink retaining member 50 measured in the direction in which the ink

receiving tube 33 is brought into contacted or abutted, is substantially the same as an inner depth of the projected portion 11c, and the first ink retaining member 50 is given substantially the same configuration as the inner configuration of the projected portion 11c of the casing 11. By doing so, the large second ink retaining member 51 can be a simple rectangular parallelopiped configuration, and therefore, the production property is improved.

In Figure 7, (a), there is shown an ink container according to a modified example of the present invention, the casing 11 having the configuration which is similar to that shown in Figure 6. The casing 11 contains a hook-shaped first ink retaining member 50 and a second ink retaining member 151 having a simple rectangular parallelopiped configuration. With such a structure, the upper surface of the first ink retaining member 50 has substantially the same shape as the bottom surface of the second ink retaining member 51, the ink 52 in the second ink retaining member 51 can be used up even when a high speed ink supply is carried out.

Figure 7, (b) illustrates a further modified example, wherein the first ink retaining member 50 (Figure 7, (a)) is divided into two parts, one of which is a lower part 50a disposed at the ink supply port 14 side and an upper part sandwiched between the

lower part 50a and the second ink retaining member 51. With this structure, an ink retaining force C1 of the lower part 50a of the ink retaining member, an ink retaining force C2 of the upper part of the ink retaining member and an ink retaining force C3 of the second ink retaining member 51, satisfy C1 > C2 > C3. With this structure, similarly to the structure shown in Figure 6, the configurations of the ink retaining members (the lower part 50a, the upper part 50b, the second ink retaining member 151) can be simplified, and similarly to the structure shown in Figure 7, (a), the ink 52 in the second ink retaining member is prevented from remaining.

In this embodiment, the configuration of the ink container 10 is such that it is projected at the ink supply port 14 side (L-shaped), but configuration of the ink container 10 is not limited to these examples, and a central portion of the ink container 10 may be projected, for example.

In the first and second embodiments described hereinbefore, the ink retaining members 50 and 51 are made of polyolefin fiber, however, the structures of the ink remaining members 50 and 51 are not limited to the fiber, and the material is not limited to a polyolefin resin material. The densities, the fiber diameters, the directions of the fibers and the like are not limited to the case of the two embodiments.

The thickness of the ink retaining members 50 and 51 measured in the direction in which the ink receiving tube 33 is abutted, is not limited to that disclosed with respect to the two embodiments, and may be properly determined in consideration of the kinds of the ink used, the structures of the ink retaining members 50 and 51, the flow rates of the ink or the like. In order to obtain a sufficient effects of the present invention, it is desirable that ratio of the thickness of the first ink retaining member 50 measure in the direction of abutment of the ink receiving tube 33 to a maximum inner diameter which is a dimension in a direction perpendicular thereto, is not less than 1:5. Further, the liquid retained in the liquid container of the present invention is not limited to the above-described ink. Further, the liquid retained in the liquid container is not limited to the color and kind (for example, back, cyan, magenta and yellow inks) even when the ink is retained in the liquid container.

[Advantageous Effect]

As described in the foregoing, in an ink container according to the present invention, the first liquid retaining member follows substantially the inner surface configuration of the portion (bottom surface) where the opening for liquid supply of the casing is provided, so that the liquid retaining space

occupied in the container is increased, and therefore, a large amount of the liquid is retained even if the container is downsized. Further, the liquid in the container is prevented from remaining, and the liquid use efficiency is improved even when a high speed liquid supply is carried out.

In addition, the first liquid retaining member is in the form of a sheet, so that the local deformation of the first liquid retaining member can be absorbed by the entire ink container when the first liquid retaining member is abutted to the outer member. The space around the first liquid retaining member generated by the bucking of the first liquid retaining member can be suppressed. Further, the inside volume of the first liquid retaining member having a larger capillary force is reduced, so that the liquid remaining in the first liquid retaining member is suppressed, and as a result, the liquid use efficiency can be improved.

[Brief Description of the Drawings]

Figure 1 is a perspective view of an outer appearance of an ink container, an ink jet head and a holder according to a first embodiment of the present invention before connection.

Figure 2 is a partly broken perspective view of an ink container, an ink jet head and a holder according to a first embodiment of the present

invention before connection.

Figure 3 is a sectional view of an ink container and an ink jet head according to a first embodiment of the present invention before connection.

Figure 4 illustrates connection between an ink container and an ink jet head according to a first embodiment of the present invention, wherein (a) is a sectional view thereof, and (b) is an enlarged view of a major part thereof.

Figure 5 illustrates ink consumption, wherein (a) - (e) are sectional views of an ink container according to a first embodiment of the present invention.

Figure 6 is a sectional view illustrating a connection between an ink container and an ink jet head according to a second embodiment of the present invention.

Figure 7, (a) is a sectional view of a modified example of an ink container and an ink jet head according to a second embodiment of the present invention, and (b) is a sectional view of another modified example.

Figure 8, (a) is a sectional view of an ink container and an ink jet head of a conventional example before connection, (c) is a sectional view illustrating a connection between the conventional ink container and the conventional ink jet head.

[Reference Numerals]

10: ink container (liquid container)

11: casing

11a: main body

11b: cap member

13: rib structure

14: ink supply port (liquid supply port)

15: air vent (opening for air vent)

30: ink jet head cartridge

31: holder

33: ink receiving tube (outer member)

34: filter

50: first ink retaining member (first liquid retaining member)

50a: lower part (first liquid retaining member)

50b: upper part (first liquid retaining member)

51: second ink retaining member (second liquid retaining member)

52: ink liquid surface